Please replace the paragraph starting on page 1, line 33 with the following replacement paragraph.

To form a fine pitch ball grid package, multiple land patterns are first formed on a rectangular, polyimide based tape. Throughholes are formed at selected portions of the polyimide based tape. The land patterns include solder ball pads, which are on a first surface of the polyimide based tape such that each of the pads covers a corresponding throughhole and has a circular plate shape. The land patterns also include conductive patterns that electrically connect to respective solder ball pads and extend to edges of the tape.

Please replace the paragraph starting on page 2, line 6 with the following replacement paragraph.

Beam leads, that is, the ends of the conductive patterns, are die-bonded to respective bonding pads of semiconductor chip. For such die bonding, rectangular openings or windows are formed at edges of the polyimide based tape. After the die bonding, an electrical test determines whether or not the land patterns have open or short failures and from the electrical test, failed land patterns are marked. An elastomer is attached to a second surface of the polyimide based tape.

Please replace the paragraph starting on page 2, line 28 with the following replacement paragraph.

FIG. 1 shows conventional die bonding equipment 100 for fabrication of ball grid array packages having a fine pitch. Referring to FIG. 1, die bonding equipment 100 generally includes a wafer mount frame stocker 5, a base mount stocker 10, a chip pickup table 15, and a bonding unit 20 on a support plate 1. A chip transfer unit 25 moves a semiconductor chip from the chip pickup table 15 to the bonding unit 20, and a guide rail unit 40 guides a base mount tape frame 35 from the base mount tape stocker 10 to the bonding unit 20. Multiple charge coupled device(CCD) cameras observe the operation of die bonding equipment 100.

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Please replace the paragraph starting on page 3, line 9 with the following replacement paragraph.

Meanwhile, an alignment table 65, which includes a mount head 60, is spaced apart from the chip pickup table 15. The mount head 60 receives a semiconductor chip from the

chip pickup table 15, moves the received semiconductor chip to the bonding unit 20, and aligns the semiconductor chip for die bonding. To align the semiconductor chip, the alignment table 65 can freely move along X-Y coordinate axes as does the chip pickup table 15, and when the semiconductor chip is skewed from the required orientation for bonding of the chip, the alignment table 65 rotates the skewed semiconductor chip for the required alignment. The alignment table 65 can also move along the Z coordinate axis direction.

Please replace the paragraph starting on page 3, line 19 with the following replacement paragraph.

Here, the chip transfer unit 25, which reciprocates between the chip pickup table 15 and the alignment table 65, transfers semiconductor chips from the wafer mount frame 45 of the chip pickup table 15. The chip transfer unit 25 includes: a collet 70 (hereinafter referred to as the first collet) for holding good semiconductor chips with a vacuum; a collet 75 (hereinafter referred to as the second collet) for holding failed semiconductor chips; and a moving block 80 including a collet selection unit (not shown) that selects the first or second collet 70 or 75 for use. The chip transfer unit 25 also includes a straight line reciprocating unit (not shown) for transferring the moving block 80.

Please replace the paragraph starting on page 3, line 28 with the following replacement paragraph.

The described base mount tape stocker 10 is spaced away from the wafer mount frame stocker 5. The guide rail unit 40 extends from an opening 85 of the base mount tape stocker 10, and a base mount tape frame 35 received at the base mount tape stocker 10 is unloaded through the opening 85. The guide rail unit 40 includes a pair of guide rails 42 and 44 that guide the base mount tape frame 35.

Please replace the paragraph starting on page 4, line 3 with the following replacement paragraph.

A bonding unit 20 is over the guide rails 42 and 44 and distant from the base mount tape stocker 10. The bonding unit 20 includes a press head 22, which moves up and down, and a bonding unit CCD camera 24, which moves together with the press head 22. The press head 22 is over the base mount tape frame 35, and the mount head 60 is below the base mount tape frame 35 so that the press head 22 faces the mount head 60. The bonding unit CCD

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camera 24 checks the position of the base mount tape frame 35 as it moves and simultaneously checks for a failed mark formed during the production of the base mount tape.

Please replace the paragraph starting on page 4, line 17 with the following replacement paragraph.

Hereinafter, the operation of the conventional die bonding equipment is described with reference to FIG. 1.

Please replace the paragraph starting on page 5, line 9 with the following replacement paragraph.

Here, when the first land pattern is good, the good semiconductor chip held by the first collet 70 is moved onto the mount head 60 of the chip alignment table 65 and is then aligned. Thereafter, the aligned good semiconductor chip is transferred onto a corresponding good land pattern of the base mount tape 30 by the movement of the mount head 60. After the transfer of the good chip, the press head 22 moves downward and the mount head 60 moves upward, so that bonding pads of the good semiconductor chip are bonded to beam leads of the good land pattern.

Please replace the paragraph starting on page 5, line 17 with the following replacement paragraph.

Meanwhile, when the first land pattern as discriminated is defective, the good semiconductor chip held by the first collet 70 returns to an original position. Then, the second collet 75 instead of the first collet 70 picks up the defective semiconductor chip and moves the defective chip onto the mount head 60. Thereafter, the defective chip is transferred to a corresponding defective land pattern of the base mount tape 30 by the movement of the mount head 60 without a specific alignment. After the transfer of the defective chip, the press head 22 moves downward and the mount head 60 moves upward, so that bonding pads of the defective semiconductor chip are bonded to beam leads of the defective land pattern.

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Please replace the paragraph starting on page 5, line 29 with the following replacement paragraph.

First, when a land pattern of the base mount tape to be die bonded is determined to be defective, the first collet 70 of the chip transfer unit 25 holds the good semiconductor chip. Therefore, the first collet 70 returns the good semiconductor chip to an original position. Instead of the first collet 70, the second collet 75 holds a defective semiconductor chip on the mount head. Accordingly, a delay occurs.

Please replace the paragraph starting on page 6, line 3 with the following replacement paragraph.

Second, the bonding unit CCD camera determines whether the land pattern of the base mount tape is good or not during the die bonding time. Accordingly, much time is spent in determining the status of the semiconductor chip.

Please replace the paragraph starting on page 6, line 23 with the following replacement paragraph.

It is another object of the present invention to shorten a time taken in determining whether a land pattern of a base mount tape is good by performing such a determination only once during the loading of the mount tape.

Please replace the paragraph starting on page 6, line 27 with the following replacement paragraph.

It is yet another object of the present invention to decrease a time taken in picking up defective semiconductor chips by establishing the defective semiconductor chip tray at the lower face of the collet of the semiconductor chip transfer unit along the trace of the collet and thereby allowing wafer extend table not to be moved in order to pick up a defective semiconductor chip.

Please replace the paragraph starting on page 7, line 1 with the following replacement paragraph.

It is yet another object of the present invention to shorten the time taken in loading defective semiconductor chips into the defective semiconductor chip tray by allowing the collet of semiconductor chip transfer to perform the work for loading defective semiconductor chips into the defective semiconductor chip tray.

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Please replace the paragraph starting on page 7, line 9 with the following replacement paragraph.

One embodiment of the present invention is a die bonding method for a fine pitch ball grid array package. The die bonding method includes inspecting the status and position of a semiconductor chip which is on a mount frame and the status and position of a land pattern of a mount tape, wherein the land pattern is on one surface of the mount tape and the other surface of the mount tape is attached to a surface of the mount frame. Thereafter, the status data and the position data corresponding to the semiconductor chip and the land pattern inspected are stored. After repeating the inspection of one or more semiconductor chips, a semiconductor chip is selected using the stored status data and the position data of the semiconductor chip and the land pattern. The selected semiconductor chip has a status matching to the status of the land pattern at a bonding region for the die bonding. The selected chip is transferred to an alignment region for an operation corresponding to the status of the transferred chip.

Please replace the paragraph starting on page 7, line 23 with the following replacement paragraph.

Another embodiment of the invention is a die bonding equipment for fine pitch ball grid array packages. The die bonding equipment includes: a semiconductor chip pickup stage for inspecting the status and position of a loaded semiconductor chip, wherein a wafer mount frame is unloaded from a wafer mount frame stocker and the wafer mount frame is loaded on the semiconductor chip pickup stage; an alignment stage spaced apart from the semiconductor chip pickup stage; a chip transfer unit for transferring the semiconductor chip from the semiconductor chip pickup stage to the alignment stage; a guide rail for a mount tape frame having a mount tape on which at least one land pattern is formed, the mount tape frame being transferred from a mount tape frame stocker in which the mount tape frame is received to a die bonding position adjacent to the alignment stage; an inspection system disposed over the guide rail, for inspecting a status and a position of the land pattern on the mount tape frame; and a bonding unit for bonding the land pattern to the semiconductor chip that is mounted on the mount head.

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Please replace the paragraph starting on page 8, line 10 with the following replacement paragraph.

FIG. 1 is a perspective view of a conventional die bonding equipment;

Please replace the paragraph starting on page 8, line 11 with the following replacement paragraph.

FIG. 2 is a perspective view of a die bonding equipment according to an embodiment of the present invention;

Please replace the paragraph starting on page 8, line 19 with the following replacement paragraph.

FIGs. 6A, 6B, and 6C together are a flow chart for a die bonding method for a fine pitch ball grid array package;

Please replace the paragraph starting on page 9, line 8 with the following replacement paragraph.

Although not shown in the drawings, the control module includes a control unit such as a microprocessor and a memory unit for storing data. Here, the memory unit permits data input and output and can be, for example, a hard disk driver (HDD) or a random access memory (RAM). The memory unit stores status information indicating whether semiconductor chips are good or defective and position data for the good or defective semiconductor chips. The memory unit also stores status information indicating whether land patterns of a base mount tape 251 are good or defective and position data for the land patterns.

Please replace the paragraph starting on page 10, line 1 with the following replacement paragraph.

The chip alignment stage 240 is on the support plate 201 and spaced apart from the chip pickup stage 220. The chip alignment stage 240 receives a semiconductor chip from the chip pickup stage 220 and moves and/or rotates the semiconductor chip in the X-Y plane, to thereby align the semiconductor chip for bonding. The chip alignment stage 240 operates according to a control signal of the control module and includes an X-Y table 246, a stage 248 on the upper surface of the X-Y table 246, and a mount head 244. An alignment stage CCD camera 242 is over the chip alignment stage 240. The alignment stage CCD camera 242

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confirms the alignment status of the semiconductor chip that is supported and fixed on the mount head 244.

Please replace the paragraph starting on page 10, line 19 with the following replacement paragraph.

As shown in FIG. 4, a pair of pulleys 237a and 237b are at opposite ends of the inner portion of the transfer unit body 232. A tension wire 238 is around pulleys 237a and 237b and moves when pulleys 237a and 237b rotate. A servo motor 239 attached to a rotational axis 239a of pulley 237a controls the rotation of pulley 27a and thereby controls the direction and distance that the tension wire 238 moves.

Please replace the paragraph starting on page 10, line 28 with the following replacement paragraph.

The defective semiconductor chip tray 236 is below the transfer unit body 232. The defective semiconductor chip tray 236 is along the transfer path of the collet unit 234, which allows the collet unit 234 to load a defective semiconductor chip from the chip pickup stage 220 and unload the defective semiconductor chip in a single row to the semiconductor chip tray 236.

Please replace the paragraph starting on page 11, line 1 with the following replacement paragraph.

Returning to FIG. 2, a long guide rail 253 for transferring the base mount frame 251 is adjacent to the chip alignment stage 240. The guide rail 253 has a guide groove (not shown) that couples to and guides the base mount frame 251 during movement along the guide rail 253. At the guide groove, there are provided multiple driving rollers (not shown) for movement of the base mount frame 251 back and forth along the guide rail 253. A mount tape frame stocker 255, which holds a stack of the base mount tape frames 251, is at one end of the guide rail 253, and the mount tape frame loader 290, which holds a stack of base mount tape frames 251 when the die bonding process is complete, is at the other end of the guide rail 253.

Please replace the paragraph starting on page 12, line 10 with the following replacement paragraph.

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In an initial step ST10 of the die bonding process, the mount frame moving unit 216 unloads one of the wafer mount frames 212 that contains separated semiconductor chips from the mount frame stocker 214 and then loads the mount frame 212 onto the ring shaped stage 222 of the chip pickup stage 220.

Please replace the paragraph starting on page 12, line 18 with the following replacement paragraph.

Meanwhile, a step ST30 unloads from the mount tape frame stocker 255 a base mount tape frame 251 having a base mount tape to which a semiconductor chip will be die-bonded. A step ST40, which is during the unloading of the base mount tape frame 251 from the mount tape frame stocker 255 and the transfer to the bonding unit 260, includes a visual inspection of the base mount tape using CCD camera 257 to determine whether the land patterns on the base mount tape 251 are good or defective. The status information indicating the results of the determination are then stored in the memory device.

Please replace the paragraph starting on page 12, line 26 with the following replacement paragraph.

FIG. 8 shows a base mount tape 251, and FIG. 9 shows a data structure 500 that includes the status data corresponding to the base mount tape 251. For step ST40, the CCD camera 257 photographs land patterns C11, C12, and C13 first and determines whether the photographed land patterns are good or defective. The determined status information for the land patterns C11, C12, and C13 are stored at addresses corresponding to entries T11, T12, and T13 in data structure 500 of FIG. 9.

Please replace the paragraph starting on page 13, line 1 with the following replacement paragraph.

In the example of FIGs. 8 and 9, the land patterns C11 and C13 did not fail the inspection and are determined to be good land patterns. Accordingly, corresponding entries T11 and T13 of the data structure 500 store a value G. In this example, the land pattern C12 failed the visual inspection and is determined to be defective. Accordingly, the corresponding entry T12 stores a symbol F. Visual inspection similarly determines the status information for all land patterns. For example, the 30 land patterns of the base mount tape attached on the

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base mount tape frame 251 of FIG 8 and their determined status data are stored in corresponding addresses of the data structure 500.

Please replace the paragraph starting on page 13, line 10 with the following replacement paragraph.

A step ST50 transfers the base mount tape frame 251 to the bonding unit 260 while visual inspection continues. After the visual inspection is completed and the inspection data of land patterns are stored, a step ST60 determines from the status information in the data structure 500 whether a first land pattern for a die bonding process is good or defective.

Please replace the paragraph starting on page 13, line 19 with the following replacement paragraph.

From step ST70, when the inspected semiconductor chip proves to be defective, step ST75 stores the defective semiconductor chip in the defective semiconductor chip tray 236. Thereafter, step ST77 visually inspects another semiconductor chip on the chip pickup stage 220 before the process returns to step ST70. A matrix such as the one illustrated in FIG. 7 can store the status information for the semiconductor chips from the chip pickup stage 220. Each semiconductor chip from the chip pickup stage 220 has a corresponding matrix element, and the value of the corresponding matrix element indicates whether the chip is good or defective. In the example of FIG 7, dots mark the defective chips. For example, a matrix element [23] corresponding to a semiconductor chip in row 2 and column 3 and matrix element [24] corresponding to a semiconductor chip in row 2 and column 4 indicate that the corresponding chips are defective.

Please replace the paragraph starting on page 13, line 31 with the following replacement paragraph.

When step ST70 determines the semiconductor chip is good, the chip transfer unit 230 picks up the good semiconductor chip in a step ST80.

Please replace the paragraph starting on page 14, line 1 with the following replacement paragraph.

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In a step ST90 (FIG. 6B), the chip transfer unit 230 transfers the good semiconductor chip to the mount head 244 of the chip alignment stage 240. The chip alignment stage 240 precisely aligns the chip in the die bonding position in a step ST100, subsequent to transferring of the semiconductor chip to the bonding unit 260 in a step ST110. More specifically, in step ST100, the alignment stage CCD camera 242 photographs the good semiconductor chip when transferred onto the chip alignment stage 240. When photographing indicates an alignment failure, the mount head 244 having the good semiconductor chip thereon rotates or moves up or down to align the good semiconductor chip. After the alignment is complete, the mount head 244 loads the good semiconductor chip onto the bonding unit 260 in step ST110.

Please replace the paragraph starting on page 14, line 12 with the following replacement paragraph.

At this time, the base mount tape frame 251 has been loaded on the bonding unit 260 and awaits the bonding process. When both of the good semiconductor chip and the base mount tape frame 251 are loaded onto the bonding unit 260, the bonding unit CCD camera 264 inspects whether the beam leads of the land patterns formed on the base mount tape of the base mount tape frame 251 are precisely aligned with bonding pads of the good semiconductor chip. A step ST120 aligns the base mount tape and the good semiconductor chip for beam lead bonding. After step ST120, a step ST130 is the beam lead bonding that the bonding unit 260 performs.

Please replace the paragraph starting on page 14 line 20 with the following replacement paragraph.

After a certain time elapses, a step ST 140 determines whether or not another land pattern for die bonding still remains. If a land pattern for die bonding does not remain, the die bonding process is complete. If a land pattern for die bonding still remains, the process returns to step ST20, which determines whether the semiconductor chip that is being die bonded to the land pattern is good or bad. The visual inspection classifies the semiconductor chip as good or defective, and the classification result is stored. In addition, inspection step ST60 again determines from the stored status data whether a land pattern that is being die-bonded is good or defective. If in step ST60 the land pattern proves not to be good, the process proceeds to a step ST150, which determines whether or not there is a defective

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semiconductor chip in the fail semiconductor chip tray 236. When no defective semiconductor chips remain in the semiconductor chip tray 236, the collet 234 picks up a defective semiconductor chip that is identified from the position data that was stored in step ST75. Otherwise, when the semiconductor chip tray 236 contains a defective semiconductor chip, the collet 234 picks up a defective semiconductor chip from the semiconductor chip tray 236. In a step ST170, the chip transfer unit 230 transfers the defective semiconductor chip as picked up to the mount head 244 of the chip alignment stage 240.

Please replace the paragraph starting on page 15, line 5 with the following replacement paragraph.

For a defective semiconductor chip transferred to the chip alignment stage 240 through steps ST150 to ST170, a step ST180 transfers the defective semiconductor chip directly to the bonding unit 260 without an alignment process. The bonding unit 260, in a step ST190, performs the die bonding for such defective semiconductor chips and defective land patterns.

Please replace the paragraph starting on page 15, line 10 with the following replacement paragraph.

After step ST190, a step ST200 determines whether or not a land pattern remains for die bonding and whether another die bonding is needed. If a land pattern for die bonding remains, the process returns to the step ST20 and repeatedly performs the steps from ST20 to ST200. When no land pattern remains for further die bonding, a step ST210 determines whether the semiconductor chip tray 236 has room for another defective semiconductor chip. When there is a vacant site in the semiconductor chip tray 236, the chip transfer unit 230, in a step ST220, loads a defective semiconductor chip from the wafer mount frame 212 onto the semiconductor chip tray 236.

Please replace the paragraph starting on page 15, line 20 with the following replacement paragraph.

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As described previously, the present invention prevents a mismatched bonding such as die bonding a good semiconductor chip to a defective land pattern or die bonding a defective semiconductor chip to a good land pattern. In particular, visual inspection determines whether a land pattern that is being die-bonded to a selected semiconductor chip is good or